CLAIMS

1. A fuel cell system, comprising:

a fuel cell stack;

a battery; and

a fuel cell control system, including a power supply switch configured to selectively couple power from the fuel cell stack to the fuel cell control system at a first time, and to selectively couple power from the battery to the fuel cell control system at a second time.

2. The fuel cell system of claim 1 wherein the battery is rechargeable and the fuel cell stack is selectively couplable to provide power to recharge the battery.

3. The fuel cell system of claim 1 wherein the power supply switch is responsive to a voltage across the fuel cell stack.

4. The fuel cell system of claim 1 wherein the power supply switch is responsive to couple power from the fuel cell stack to the fuel cell control system at the first time while a voltage across the fuel cell stack is above a fuel cell stack threshold voltage and to couple power from the battery to the fuel cell control system at the second time while the voltage across the fuel cell stack is below the fuel cell stack threshold voltage.

5. The fuel cell system of claim 1 wherein the power supply switch is responsive to couple power from the fuel cell stack to the fuel cell control system at the first time when a voltage across the fuel cell stack rises above a first fuel cell stack threshold voltage and to couple power from the battery to the fuel cell control system at the second time when the voltage across the fuel cell stack falls below a second fuel cell stack threshold voltage.

6. The fuel cell system of claim 1 wherein the power supply switch is responsive to an operating state of the fuel cell system.

7. The fuel cell system of claim 1 wherein the power supply switch is responsive to an operating state of the fuel cell system and further including a second power supply switch responsive to a voltage across the fuel cell stack in at least one of a number of the operating states of the fuel cell system.

8. A fuel cell control system for controlling operation of a fuel cell system having a fuel cell stack, the fuel cell control system comprising:

a microcontroller;

at least one sensor positioned to measure an operating parameter of the fuel cell system and coupled to provide signals to the microcontroller corresponding to the measured operating parameter;

at least one actuator coupled to receive signals from the microcontroller in response to the measured operating parameter; and

a power switching circuit configured to selectively couple power from the fuel cell stack to the microcontroller at a first time, and to selectively couple power from a battery to the microcontroller at a second time.

9. The fuel cell control system of claim 8 wherein the power switching circuit is responsive to an operating state of the fuel cell system.

10. The fuel cell control system of claim 8 wherein the power switching circuit is responsive to a voltage across the fuel cell stack in at least one of a number of the operating states of the fuel cell system.

11. The fuel cell control system of claim 8 wherein the power switching circuit comprises a stack supply switch responsive to an operating state of the fuel cell system and a battery supply switch responsive to a voltage across the fuel cell stack in at least one of a number of the operating states of the fuel cell system.

12. The fuel cell control system of claim 8 wherein the power switching circuit comprises a voltage responsive switching circuit having an output coupled to the microcontroller, a stack supply switch responsive to an operating state of the fuel cell system to provide an electrical path between the fuel cell stack and the voltage responsive switching circuit and a battery supply switch responsive to a voltage across the fuel cell stack to provide an electrical path between the battery and the voltage responsive switching circuit.

13. The fuel cell control system of claim 8 wherein the power switching circuit comprises a diode-OR circuit, a stack supply switch responsive to an operating state of the fuel cell system to provide an electrical path between the fuel cell stack and the diode-OR circuit and a battery supply switch responsive to a voltage across the fuel cell stack to provide an electrical path between the battery and the diode-OR circuit.

14. A fuel cell control system for controlling operation of a fuel cell system having a fuel cell stack, the fuel cell control system comprising:

a microcontroller;

at least one sensor positioned to measure an operating parameter of the fuel cell system and coupled to provide signals to the microcontroller corresponding to the measured operating parameter;

at least one actuator coupled to receive signals from the microcontroller in response to the measured operating parameter; and

a power supply switch configured to selectively switch power from the fuel cell stack to at least one of the microcontroller, the sensor and the actuator when a voltage across the fuel cell stack is above a first fuel cell stack threshold voltage and to selectively switch power from a battery to at least one of the microcontroller, the sensor and the actuator when the voltage across the fuel cell stack is below a second fuel cell stack threshold voltage.

15. The fuel cell control system of claim 14 wherein the second fuel cell stack threshold voltage is less than the first fuel cell stack threshold voltage.

16. The fuel cell control system of claim 14 wherein the power supply switch comprises:

a diode-OR circuit having a first input, a second input, and an output, the first input couplable to the fuel cell stack, the output coupled to at least one of the microcontroller, the sensor and the actuator;

a battery supply transistor coupled between the battery and the second input of the diode-OR circuit.

17. A fuel cell control system for controlling operation of a fuel cell system having a fuel cell stack, the fuel cell control system comprising:

a microcontroller;

at least one sensor positioned to measure an operating parameter of the fuel cell system and coupled to provide signals to the microcontroller corresponding to the measured operating parameter;

at least one actuator coupled to receive signals from the microcontroller in response to the measured operating parameter; and

a power supply switch configured to selectively switch power from the fuel cell stack to the microcontroller in a first operating state when a voltage across the fuel cell stack is above a first fuel cell stack threshold voltage and to selectively switch power from a battery to the microcontroller in the first operating state when the voltage across the fuel cell stack is below a second fuel cell stack voltage.

18. The fuel cell control system of claim 17 wherein the power supply switch comprises:

a diode-OR circuit having a first input, a second input, and an output, the output coupled to at least one of the microcontroller, the sensor and the actuator;

a battery supply transistor coupled between the battery and the first input of the diode-OR circuit; and

a fuel cell stack transistor coupled between the fuel cell stack and the second input of the diode-OR circuit.

19. A controller-readable media carrying instructions for causing a controller to control operation of a fuel cell system having a fuel cell stack and a battery, by:

coupling power from the fuel cell stack to the controller when a voltage across the fuel cell stack moves above a first threshold voltage; and

coupling power from the battery to the controller when the voltage across the fuel cell stack drops below a second threshold voltage.

20. The controller-readable media of claim 19 wherein second threshold voltage is lower than the first threshold voltage.

21. A method of operating a fuel cell system, comprising:

providing power from a fuel cell stack to a fuel cell control system at a first time; and

providing power from a battery to the fuel cell control system at a second time.

22. The method of claim 21 wherein the first time corresponds to a time when a voltage across the fuel cell stack is above a first threshold voltage and the second time corresponds to a time when the voltage across the fuel cell stack is below the first threshold voltage.

23. The method of claim 21 wherein the first time corresponds to a time when a voltage across the fuel cell stack is above a first threshold voltage and the second time corresponds to a time when the voltage across the fuel cell stack is below a second threshold voltage, different from the first threshold voltage.

24. The method of claim 21 wherein the first time corresponds to a time when the fuel cell system is in a first operating state and the second time corresponds to a time when the fuel cell system is in a second operating state.

25. The method of claim 21 wherein the first time corresponds to a time when the fuel cell system is in a first operating state and a voltage across the fuel cell stack is above a first threshold voltage, and the second time corresponds to a time when the fuel cell system is in the first operating state and the voltage across the fuel cell stack is below a second threshold voltage.

26. The method of claim 21 wherein providing power from a fuel cell stack to a fuel cell control system at a first time, includes coupling the fuel cell control system to the fuel cell stack if a voltage across the fuel cell stack is above a threshold voltage.

27. The method of claim 21 wherein providing power from a battery to a fuel cell control system at a first time, includes coupling the fuel cell control system to the battery if a voltage across the fuel cell stack is below a threshold voltage.

28. The method of claim 21 wherein providing power from a fuel cell stack to a fuel cell control system at a first time, includes coupling the fuel cell control system to the fuel cell stack if a voltage across the fuel cell stack is above a first threshold voltage and wherein providing power from a battery to a fuel cell control system at a second time, includes coupling the fuel cell control system to the battery if a voltage across the fuel cell stack is below a second threshold voltage.

29. A method of operating a power switching circuit in a fuel cell system to couple power to an on-board power supply selectively from a fuel cell stack and a battery, the method comprising:

changing a state of a stack supply switch to couple the fuel cell stack to the on-board power supply when entering a running operational state of the fuel cell system from a starting operational state of the fuel cell system;

setting a state of a battery supply switch to uncouple the battery from the on-board power supply if a voltage across the fuel cell stack is above an upper fuel cell stack threshold voltage;

setting the state of the battery supply switch to couple power the battery to the on-board power supply if the voltage across the fuel cell stack falls below a lower fuel cell stack threshold voltage; and

changing the state of the stack supply switch to couple the battery to the on-board power supply when entering a stopping operational state of the fuel cell system from the running operational state.

30. The method of claim 29 wherein changing a state of the stack supply switch includes coupling a signal from the controller to a switching input terminal of the stack supply switch.

31. The method of claim 29 wherein the battery supply switch is a transistor and setting a state of the battery supply switch includes coupling a signal from a comparison circuit to a switching input terminal of the transistor.

32. The method of claim 29, further comprising:

coupling the battery supply switch to a first input of a diode-OR circuit; and

coupling the stack supply switch to a second input of the diode-OR circuit.

33. The method of claim 29, further comprising:

determining that the voltage across the fuel cell stack exceeds a third threshold voltage before entering a running state.